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BOTANY.—*Studies in Lonchocarpus and related genera, I: A Synopsis of Willardia*.<sup>1</sup> FREDERICK J. HERMANN, U. S. Department of Agriculture.

The relationship of the leguminous genus *Willardia*, of the tribe Galegeae, characterized by the possession of dehiscent pods, with *Lonchocarpus*, of the tribe Dalbergieae, which have indehiscent fruits, would not appear to be very close. The resemblance of the two groups is so great, however, particularly in the flowering or in the merely vegetative condition, that an observer as astute as Bentham (1) erroneously referred to *Lonchocarpus* two species which, when subsequently collected in the fruiting

stage, proved to belong to *Willardia*; and no less than five additional arborescent legumes from Mexico and Central America described by other authors as *Lonchocarpus* now appear to be logically assigned to *Willardia*. A brief synopsis of *Willardia*, heretofore supposed to comprise but three species, may consequently be useful.

The genus *Willardia* was established by J. N. Rose (2) in 1891, its basis being Sereno Watson's *Coursetia mexicana*, which had been described from fruiting material alone. Rose pointed out that additional specimens in flower showed the plant to be

<sup>1</sup> Received June 17, 1947.

amply distinct from *Coursetia* in its "truncate" calyx and glabrous style. In 1905 Rose (3) added a second species to the genus, *Willardia parviflora*. Standley (4), in his *Trees and shrubs of Mexico* (1922), transferred Bentham's *Lonchocarpus eriophyllus* to *Willardia* and provided a key to the three species of the genus then known. The most recent account of the group appeared in North American Flora in 1924, wherein Rydberg (5) presented a comprehensive treatment of the three species.

In current studies of the Mexican and central American material of *Lonchocarpus* from the U. S. National Herbarium and the Chicago Natural History Museum by the writer it was noted that an excellent series of collections by Hinton of *Lonchocarpus obovatus* Benth. included several specimens bearing pods that had a decidedly unconventional aspect for *Lonchocarpus*. In contrast with fruits characteristic of this genus, highly variable though they are, these pods were almost marginless with the epidermis conspicuously marked by elongated resin ducts. Both of these features are possessed by the legumes of *Willardia*, and closer inspection revealed the fact that several of the oldest pods showed the beginning of dehiscence. From comparison of the floral and vegetative morphology with that of the latter genus the Hinton collections were found to fall well within its limits, while their comparison with a fragment (consisting of a flower and a leaflet) of the type in the U. S. National Herbarium and with a photograph of the complete type specimen of *Lonchocarpus obovatus* showed them to be an excellent match with it.

The tardily dehiscent pods of species of *Willardia* leads to their frequent confusion, even during most of the fruiting stage, with *Lonchocarpus*. A second instance of such misidentification appears in the case of Harms's *Lonchocarpus argyrotrichus*. Collections by Hinton again proved to be the solution here. His flowering specimen, 8059 (distributed as *Willardia eriophylla*), agrees in all essential points with the type collection of *Lonchocarpus argyrotrichus*, but mature pods collected seven months earlier from the same plant are plainly dehiscent.

Such differences as could be found be-

tween *Lonchocarpus lindsayi* Standl., recently described from Panama, and *L. calderoni* Standl., of El Salvador, appear to be wholly quantitative, so that *L. lindsayi* seems better regarded as a geographic variety of the latter. *L. calderoni*, however, is apparently identical with *L. salvinii* Harms, described from Guatemala, which, in turn, differs in no essential character from the Mexican *Robinia schiedeana* Schlecht. Schlechtendal's species was transferred to *Lonchocarpus* by Harms at the same time that he proposed *L. salvinii*, from which he believed it differed "*durch etwas kleinere Kelche und zartere meist einblütige, selten zweiblütige Pedunculi*." Measurements of a large series of calyces, however, fail to substantiate any difference in size, and the slenderer, mostly 1-flowered, seldom 2-flowered, peduncles of the type of *Robinia schiedeana* are to be ascribed to the greater maturity of the specimen: fruiting material of *L. salvinii* displays conspicuously elongated peduncles upon which more than one pod is only rarely developed. In none of the material described under the above names are the wing petals adherent to the keel, as they are in *Lonchocarpus*: the distinctly cyathiform calyces would be another anomaly in that genus; and although the fruiting specimens do not have pods old enough for dehiscence to have begun, they are characteristically those of *Willardia*, the resin ducts being quite conspicuous.

The transfer to *Willardia* of the three species considered to be distinct in the above discussion results in doubling the number of species so far known in this genus.

#### TAXONOMIC TREATMENT

**Willardia** Rose, Contr. U. S. Nat. Herb. 1: 97. 1891. Type species: *Coursetia mexicana* S. Wats.

#### KEY

Corolla 6–15 mm long, glabrous or glabrate; mature leaflets glabrous to sparsely pilose; pods glabrous to puberulent or sericeous.

Pods narrow (9–12 mm wide), the margins plainly thickened.

Corolla 6–7 mm long; leaflets 11–21, very small (8–16 mm long); pods glabrous  
.....1. *W. parviflora*

Corolla 10–15 mm long (in *W. schiedeana* var. *lindsayi* 8.5–9.5 mm); leaflets 5–12 (15), larger, 20–45 mm long (sometimes only 10 mm in *W. schiedeana* var. *lindsayi*); pods glabrous to silky-strigose.

Pods glabrous, abruptly contracted into a stipe; corolla 8.5–11 mm long. . . . .

..... 2. *W. schiedeana*  
Pods sericeous, long-tapering at the base; corolla 12–15 mm long. 3. *W. mexicana*

Pods broader (13–18 mm wide), the margins scarcely evident. . . . . 4. *W. obovata*

Corolla 20–23 mm long, at least the banner densely pubescent; mature leaflets silky-strigose to velutinous; pods velutinous.

Leaflets 11–23, relatively small (15–35 by 8–10 mm); pubescence of calyx and corolla tomentose to velutinous; pods 9–13 by 1.3 cm, thin, velutinous. . . . . 5. *W. eriophylla*

Leaflets 7–9, larger (30–75 by 15–30 mm); pubescence of calyx and corolla sericeous; pods 8–13.5 by 1.7–2.3 cm., thick and rigid, densely velutinous to lanate. . . . .

..... 6. *W. argyrotricha*

1. *Willardia parviflora* Rose, Contr. U. S. Nat. Herb. 8: 313. 1905.

Type locality: Yautepec, State of Morelos, Mexico, Pringle 8470.

Distribution: Lava fields and dry, sunny fields, Yautepec, and between Cuernavaca and Alpuyeca, Morelos.

Representatives: I. K. Langman 3516; Pringle 8470, 11347; Rose & Painter 6576.

2. *Willardia schiedeana* (Harms) Hermann, comb. nov. *Robinia schiedeana* Schlecht., Linnaea 12: 306. 1838. *Lonchocarpus schiedeanus* Harms, Fedde Rep. Spec. Nov. 17: 324. 1921. *Lonchocarpus salvinii* Harms, l.c. 323 (type: Volcán de Fuego, Guatemala, *Salvin* in 1873–74). *Lonchocarpus calderoni* Standl., Journ. Washington Acad. Sci. 15: 476. 1925 (type: Cerro de Guayabal, El Salvador, *S. Calderón* 22022).

Type locality: Between Veracruz and Santa Fé, Mexico *Schiede* 621 (Field Mus. photo no. 18406).

Distribution: Forests and clearings, State of Veracruz, Mexico, Guatemala and El Salvador.

Representatives: *Calderón* 1979, 2022; *Salvin* in 1873–74; *Standley* 58059, 64752, 64872.

2a. *Willardia schiedeana* var. *lindsayi* (Standl.) Hermann, comb. nov. *Lonchocarpus lindsayi* Standl., Field Mus. Publ. Bot. 17 (2): 195. 1937.

Type locality: Bejuco, Canal Zone, Panama, *W. L. Lindsay* 446.

Distribution: Known only from the type locality.

Representatives: *W. L. Lindsay* 399, 446.

Differs from the typical form in its smaller leaflets (10–25 by 7–13 mm), slightly smaller corolla (8.5–9.5, rather than 10–11, mm long), and particularly in its short pods (3–5.5, rather than 5.5–8, cm in length).

3. *Willardia mexicana* (S. Wats.) Rose, Contr. U. S. Nat. Herb. 1: 98. 1891: *Coursetia* (?) *mexicana* S. Wats., Proc. Amer. Acad. 21: 424. 1886.

Type locality: Hacienda San Miguel, Chihuahua, Mexico, *E. Palmer* "C".

Distribution: Forested slopes, southeastern Chihuahua, Sonora and Sinaloa, Mexico.

Representatives: *Gentry* 1446, 2205; *Ortega* 4556, 5217, 5502; *Palmer* "C", 332, 717.

4. *Willardia obovata* (Benth.) Hermann, comb. nov. *Lonchocarpus obovatus* Benth., Journ. Linn. Soc. 4: Suppl. 92. 1860.

Type locality: Chilla, Puebla, Mexico, *Andrieux* 440.

Distribution: Dry hills, barrancas, and llanos States of Michoacán and Mexico to Puebla and Guerrero, Mexico.

Representatives: *Andrieux* 440; *Hinton* 3742, 5523, 5937, 5942, 5946, 6290, 6958, 6959, 7041.

The leaflets in this species (5 to 9 in number) are extremely variable in outline and vesture. Ranging from 1.6–4.5 cm by 0.9–2.5 cm in size, they are commonly ovate-elliptic with tapering base and obtuse apex, but in *Hinton* 6290, for example, they are predominately orbicular-ovate to broadly ovate (the terminal generally obovate) with emarginate apices, whereas in *Hinton* 6959 they are elliptic to oblanceolate with acute apices. These variations do not appear to be correlated with the season, as does the vesture. Very young leaflets are usually densely sericeous, especially beneath, but at maturity they become completely glabrous. The pods (6–15 cm by 1.3–1.8 cm) are elliptic to oblong, long-tapering at both ends, thin, very flat, and at first finely appressed-sericeous with a marked silvery sheen but becoming glabrate and tawny-brown.

5. *Willardia eriophylla* (Benth.) Standl., Contr. U. S. Nat. Herb. 23: 483. 1922. *Loncho-*

*carpus eriophyllus* Benth., Journ. Linn. Soc. 4: Suppl. 94. 1860.

Type locality: Chilla, State of Puebla, Mexico, *Andrieux* 439.

Distribution: Lava fields and rocky gulches, States of Puebla, Morelos, and Guerrero, Mexico.

Representatives: *Langlassé* 236; *Pringle* 8987, 11348.

6. *Willardia argyrotricha* (Harms) Hermann, comb. nov. *Lonchocarpus argyrotrichus* Harms, Fedde Rep. Spec. Nov. 17: 320. 1921.

Type locality: Near Tlaxmalac, District of Hidalgo, State of Guerrero, Mexico, *Seler* 4276

Distribution: Hills, States of Mexico and Guerrero, Mexico.

Representatives: *Hinton* 7085, 8059; *E. W. Nelson* 2043; *Seler* 4276.

In addition to the characters given in the foregoing key for the hitherto undescribed pods. represented in *Hinton* 7085, it may be mentioned that they are approximately oblong

in outline, thick-margined, especially the vexillar suture, deep tan in color, and 1-3-seeded (seed 13 by 9 mm, semilunate, dark mahogany-red). The blades of the leaflets, borne on petiolules 6-8 mm long, are strigose above and somewhat appressed-pilose beneath; in *Hinton* 7085 (in fruit) they are oblanceolate, tapering at the base, with an abruptly acuminate apex (45-63 mm by 18-22 mm), whereas in *Hinton* 8059 (same tree in flower) they are oval-elliptic, rounded at the base, and obtuse at the apex (75 by 30 mm).

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ENTOMOLOGY.—*A new species of Pristocephophilus from Oregon, and remarks on certain special glands of Orthoptera (Gryllacrididae; Rhaphidophorinae).*<sup>1</sup>  
ASHLEY B. GURNEY, U. S. Bureau of Entomology and Plant Quarantine.  
(Communicated by R. E. BLACKWELDER.)

The genus *Pristocephophilus* occurs in Mexico and the western parts of the United States and Canada. The species superficially resemble those of the well-known genus *Ceuthophilus* but differ conspicuously in that males of most species bear large spines, tubercles, or other distinctive structures on the dorsum of the abdomen. There are additional differences between the two genera, such as the crenulations of the ovipositor of *Pristocephophilus*, rather than distinct teeth which rarely are absent in *Ceuthophilus*, and the absence in *Ceuthophilus* of a basal, ventral, sensory seta on each tarsal claw. My friend Borys Malkin, of the University of Oregon, has recently sent to the National Museum specimens of a new species of *Pristocephophilus*, which has the dorsum of the male abdomen specialized in a very ornate and remarkable manner. The only previously described species which approaches the new one in

dorsal specialization is *gaigei* Hubbell, 1925, described from the Olympic Mountains, Mason County, Wash. Although there is no definite information concerning the benefits which these insects may derive from the specialized abdominal structures, glandular activity may be involved, and a discussion of such functions in related Orthoptera is included to point out the nature of this possibility.

My appreciation is extended to Mr. Malkin for making this interesting species available for study; also to my colleague Arthur D. Cushman, for preparing the illustrations.

#### *Pristocephophilus sargentae*, n. sp.

FIGS. 1-5

*Male* (holotype).—General size about average for genus. Head with fastigium extending in front of eyes, moderately less elongate and acute than in *celatus* (Sc.). Antenna delicate, slender, with about 130 segments (plus a few lost apical ones).

<sup>1</sup> Received May 22, 1947.